

IN THE CLAIMS:

Claims 1-125 (Canceled)

126. (Currently Amended) An apparatus for generating a map of a gemstone, and marking the gemstone with a predetermined pattern, comprising:

a marking system for directing an energy beam along an axis;
an alignment system to align the axis relative to the gemstone to define a marking position, the marking system being controlled to produce a mark on the gemstone at said marking position;
a processor for controlling the marking system and alignment system to bring the axis and the gemstone to a succession of marking positions to define the predetermined pattern; and
{{a}} an optical mapping system for mapping the gemstone.

127. (Previously Presented) The apparatus according to claim 126, wherein the gemstone comprises a diamond.

128. (Previously Presented) The apparatus according to claim 126, wherein the marking system comprises a laser energy source.

129. (Previously Presented) The apparatus according to claim 128, wherein the laser energy source is focused to a focal point.

130. (Previously Presented) The apparatus according to claim 129, wherein the alignment system aligns the focal point with a desired marking location on the surface of the gemstone.

131. (Previously Presented) The apparatus according to claim 126, wherein the succession of marking positions are adjacent.

132. (Previously Presented) The apparatus according to claim 126, wherein the marking at the succession of marking positions produces a set of overlapping markings.

133. (Previously Presented) The apparatus according to claim 126, wherein the system for mapping the gemstone maps surface features.

134. (Previously Presented) The apparatus according to claim 126, wherein the system for mapping the gemstone maps a feature.

135. (Previously Presented) The apparatus according to claim 134, wherein the feature comprises a flaw.

136. (Previously Presented) The apparatus according to claim 126, wherein said processor controls said mapping system to map the gemstone.

137. (Previously Presented) The apparatus according to claim 126, wherein the marking pattern comprises an identification code.

138. (Previously Presented) The apparatus according to claim 126, wherein the marking pattern comprises an arbitrary inscription.

139. (Currently Amended) A method of laser marking on a gemstone surface comprising the steps of:

(a) coating the gemstone surface with a material that is capable of absorbing energy of a laser beam such that a permanent mark is formed on the gemstone surface when illuminated by a laser beam of sufficient energy, said coating absorbing laser light with higher efficiency than the gemstone surface alone; and

(b) marking the coated gemstone surface with a focused laser beam of said sufficient energy, whereby the permanent mark is formed on the gemstone, wherein said marking is controlled using feedback from an electronic imager and an output of a an optical mapping system.

140. (Previously Presented) The laser marking method according to claim 139, wherein said permanent mark is etched into the gemstone.

141. (Previously Presented) The laser marking method according to claim 139, wherein a laser beam of an energy in excess of said sufficient energy is required to efficiently produce a permanent mark on the gemstone in an absence of the coating.

142. (Previously Presented) The method according to claim 139, wherein the gemstone comprises a diamond.

143. (Previously Presented) The method according to claim 139, wherein said coating permits operation of said laser in a mode which would not reliably produce the permanent mark on the gemstone in the absence of the coating.

144. (Previously Presented) The method according to claim 139, wherein said marking is controlled to produce a succession of permanent marks in a predetermined pattern.

145. (Previously Presented) The method according to claim 139, further comprising the step of receiving from a user a definition of desired marking pattern.

146. (Previously Presented) The method according to claim 139, wherein the permanent mark comprises an element of an identification code.

147. (Previously Presented) The apparatus according to claim 139, wherein the permanent mark comprises an element of an arbitrary inscription.

148. (Previously Presented) The method according to claim 139, wherein the coating comprises a dye.

149. (Previously Presented) The method according to claim 139, wherein the coating comprises an ink.

150. (Cancelled).

151. (Previously Presented) An attachment according to claim 154, wherein said marking position establishing system comprises a diamond orientation means and a beam orientation means.

152. (Previously Presented) An attachment according to claim 151, wherein said mapping apparatus has a turntable with a central axis of rotation and a top surface for the fixation thereon of said diamond, said turntable constituting said diamond orientation means.

153. (Previously Presented) An attachment according to claim 151, wherein said beam orientation system is capable of adjusting the length of said optical path and of moving said path along said central axis.

154. (Currently Amended) A diamond marking attachment for a 3D optical diamond mapping apparatus capable of generating a map of a diamond whose surface is to be marked with a predetermined pattern and of determining a succession of marking points representing said pattern, said attachment comprising:

a laser source with its associated focusing optics for emitting a focused laser beam along an optical path;

marking position establishing system to move the optical path relative to the diamond and to thereby bring them both in a marking position, and

computer means to manipulate said marking position establishing system to bring the laser beam and the diamond into said marking position successively in each of said marking points, further comprising a base with said laser source and said beam orientation system mounted therein, the base having support surfaces for mounting thereon said optical diamond mapping apparatus, said computer means being capable of manipulating controlling both said apparatus to optically generate a map of a diamond and said attachment to mark the diamond with the predetermined pattern.

155. (Previously Presented) An attachment according to claim 154, wherein said beam orientation system comprises a laser displacement device for computer controlled linear displacement of said laser source with its associated focusing optics along a leading section of the optical path and thereby adjusting the length of the optical path.

156. (Previously Presented) An attachment according to claim 155, wherein said base has guides and said laser displacement device is in the form of a cartridge displaceable along said guides and carrying said laser with its focusing optics.

157. (Previously Presented) An attachment according to claim 156, wherein said base is in the form of a frame having a hollow area between said support surfaces for locating therein said laser source so as to ensure that said leading section of the optical path extends

within said hollow area in a first plane oriented perpendicular to said central axis and disposed under said top surface of the turntable.

158. (Previously Presented) An attachment according to claim 157, wherein said beam orientation system further comprises optical components mounted in said base to bring the optical path from said leading section to a trailing portion lying in a second plane parallel to and located above said top surface of the turntable.

159. (Previously Presented) An attachment according to claim 158, wherein at least one of said optical components is movable along an axis parallel to said central axis.

160. (Previously Presented) An attachment according to claim 154, wherein said computer means is capable of generating appropriate position corrections whenever the diamond surface to be marked is not in its predetermined position.

161. (Previously Presented) An attachment according to claim 154, wherein said pattern is a sawing line generated by said mapping system.

162. (Previously Presented) An attachment according to claim 154, wherein said pattern is of the kind to be introduced into said apparatus by a user.

163. (Previously Presented) An attachment according to claim 162, wherein said pattern is an identification code.

164. (Previously Presented) An attachment according to claim 162, wherein said pattern is an arbitrary inscription.

165. (Currently Amended) A method of laser marking on a diamond surface comprising the steps of:

(a) coating the diamond surface with a material that is capable of interacting with a laser beam in a way that a permanent mark is etched therethrough into the diamond surface, at much lower laser power E_1 than the power E_2 , that would have been required for achieving such marking directly on the diamond surface without the coating; and

(b) marking the coated diamond surface with a focused laser beam of the power E_1 wherein said marking is controlled using feedback from an electronic imager and an output of a an optical mapping system.

166. (Previously Presented) A method according to claim 165, wherein step (b) is performed by a diamond marking machine having a laser source of the power E_1 and capable of moving intermittently to successive points on the surface in accordance with a predetermined pattern.

167. (Cancelled).

168. (Previously Presented) A method according to claim 165, wherein said marking comprises a pattern of the kind to be introduced into said apparatus by a user.

169. (Previously Presented) A method according to claim 165, wherein said marking comprises an identification code.

170. (Previously Presented) A method according to claim 165, wherein said marking is an arbitrary inscription.

171. (Currently Amended) A method of laser marking on a diamond surface comprising the steps of:

(a) coating the diamond surface with a material that is capable of interacting with a laser beam in a way that a permanent mark is etched therethrough into the diamond surface, at reduced laser intensity than the intensity that would have been required for achieving such marking directly on the diamond surface without the coating; and

(b) marking the coated diamond surface with a focused laser beam of the reduced intensity, wherein said pattern is a line generated based on a system for optically mapping the diamond, and wherein said marking is controlled using feedback from an electronic imager.

172. (Previously Presented) A method according to claim 171, wherein step (b) is performed by a diamond marking machine having a laser source and capable of moving intermittently to successive points on the surface in accordance with a predetermined pattern.

173. (Cancelled).

174. (Previously Presented) A method according to claim 171, wherein said pattern is of the kind to be input by a user.

175. (Previously Presented) A method according to claim 171, wherein said pattern is an identification code.

176. (Previously Presented) A method according to claim 171, wherein said pattern is an arbitrary inscription.

Claims 177-201 (Cancelled).

202. (Previously Presented) A method according to claim 171, wherein said marking is controlled based on a detection of the coating by the electronic imager.

203. (Previously Presented) A method according to claim 165, wherein said marking is controlled based on a detection of the coating by the electronic imager.

204. (Previously Presented) A method according to claim 139, wherein said marking is controlled based on a detection of the coating by the electronic imager.